Toyota Treasure Hunting Process

Toyota Treasure Hunt System Turns Up Savings and Uses the Expertise of Process Engineers

"Using People Resources for Energy Reduction"

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What is a Treasure Hunt?

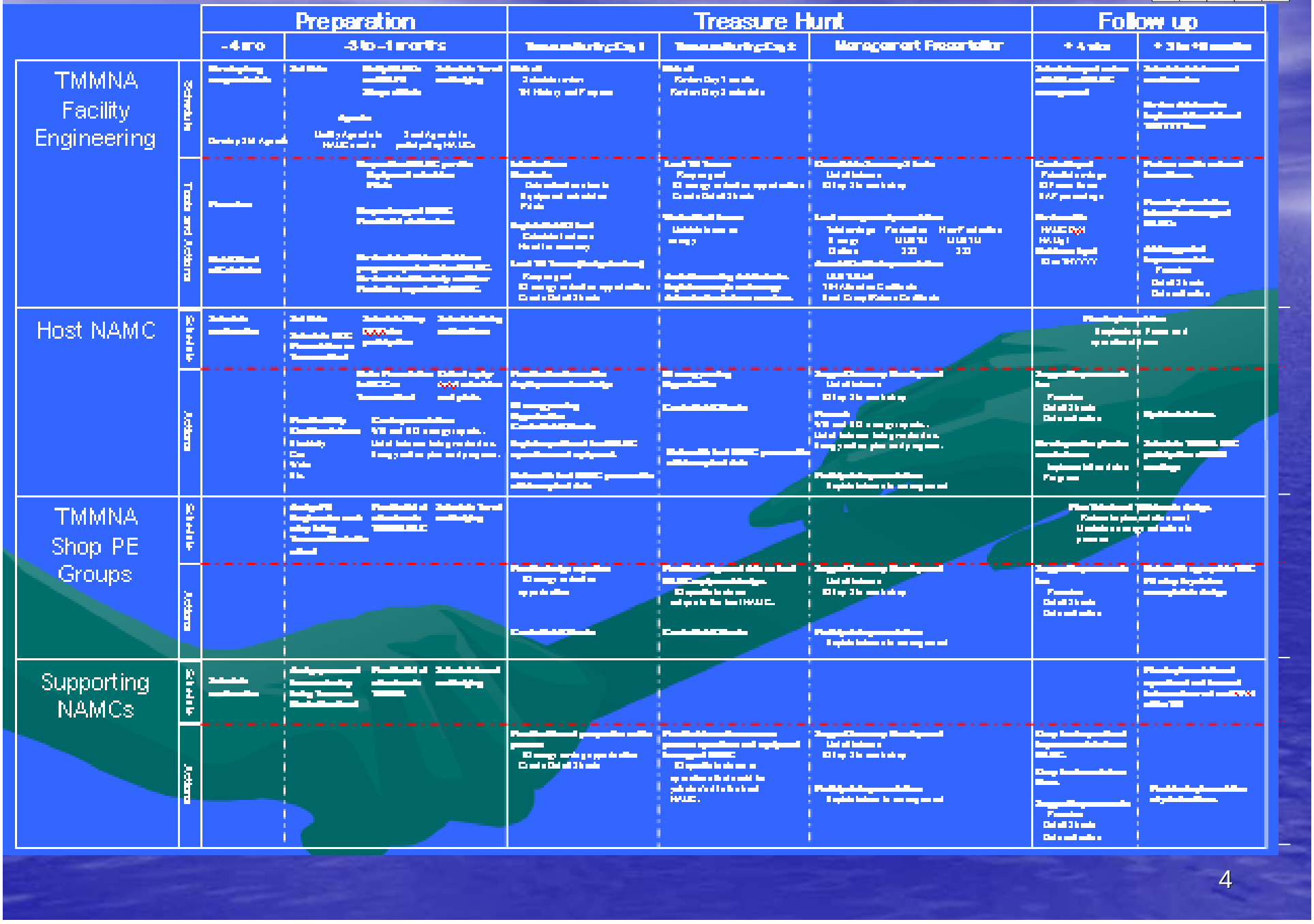
- Internal Energy auditing process.
- Internal company resources (people and skills) identify energy reduction opportunities.

Treasure Hunt Operating Procedure

- The process start months before the actual event.
- Contact between the North American Manufacturing Company (NAMC) and TMMNA.
  - Set dates.
  - Brief senior management.
  - Identify NAMC participants.
  - Identify support NAMCs.
- Involve process engineering, maintenance and operations.
  - Process Engineering in charge of design.
  - Process maintenance personnel who repair the equipment.
  - Process Operators
- Make use of the existing energy management organization.

Facility Engineering OP for Treasure Hunts

VP	GM/ AGM	MGR	Coord.	Orig.



Why Does a Treasure Hunt Work?

- Preparation and planning.
- Management involvement and support.
- Process Experts from similar NAMCs.
  - Engineering, maintenance and/or operators.
- Energy management organization involvement.
- Team member training.

The Process: Day 1-Sunday

Kick Off Meeting
- Safety Training/Orientation
- Introduction to Toyota TH Tools
- Energy Training

- Audit selected shops for weekend energy use.
  - Identify all process and building equipment that is operating: need to run? turned it off?
  - Measure/meter consumption of equipment.
- Reconvene for Reflection Meeting
  - Discuss what was found.
  - Presents opportunities for other groups to review.

The Process: Day 2-Monday

- Kick Off Meeting prior to start of production
  - Review plan.
  - Describe desired activities.
- Audit selected shops for start up energy use.
  - Identify all process and building equipment that is operating.
  - Measure/meter consumption of equipment.

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The Process: Day 2-Monday

- Continue audit after start up.
  - Observe process equipment operation.
  - Use team knowledge of process operation at the host NAMC and other NAMCs to identify opportunities.
  - Collect data:
    - Check for down flows, air flows, water flow rates, set points.
  - Compare host NAMC equipment against kaizen thought.
    - Equipment to operate in the mode desired?
    - What modifications might have to be made?
  - Observe process performance.
    - Identify process kaizen changes based on guest NAMC experience and knowledge.
    - Discuss with host NAMC operational and engineering

(Continued)

The Process: Day 2-Monday

- Start detail sheet development.
  - Describe the current situation.
  - Quantify current consumption and cost.
  - Describe the proposed situation.
  - Estimate installation / modification costs.
- Daily Reflection meeting
  - Spokesperson tells the group what was found.
  - Identifies opportunities other groups may have missed.

The Process: Day 3-Tuesday

- Kick Off Meeting one hour prior to start of production
  - Review plan.
  - Describe desired activities.
- Continue to Audit selected shops.
- Review detail sheets and collect data.
- Continue detail sheet development.
  - Describe the current situation.
  - Quantify consumption and cost
  - Describe the proposed situation.
  - Estimate installation/modification costs.

(Continued)

The Process Day 3-Tuesday

- Prepare for management presentation.
  - Totalize Savings.
  - Prioritize for implementation.
    - A < 1 year
    - B < 2 years
    - C > 2 years
  - Select three “best” kaizens.
- Management Presentation.
  - Introduce team.
  - Present total energy savings and cost reduction.
  - Three “best” items from each team.
- Closing statements.

(Continued)

Post Treasure Hunt

- Prepare Summary Report.
- NAMC prioritizes identified opportunities.
- Follow up with NAMC on implementation.

June 2004 Treasure Hunt Summary Sheet

Shop	# Kaizens	NG MMBTU	Elec. kWH	Water kGal	Total MMBTU	MMBTU/Veh	% Energy Target	Total CO2	CO2/Veh.	Est.$ Saving	Est. Cost Implem	Simple Payback Period
Assy 1	36	-	299049	456	12070	0.0269	4.18%	809	0.011	$$	$$	0.49
Assy 2	25	-	364557	-	12439	0.0277	4.30%	987	0.014	$ $	$$	0.78

Summary:
Process Involvement

- Process engineering, maintenance and operations personnel.
  - From host NAMC
  - From associated NAMCs (Those with similar processes)
  - TMMNA PE engineers for shops being Treasure Hunted
- Compare and contrast process operations between plants.
  - Review how the local process operates.
  - Review how it operates at other NAMCs
- Develop a plan based on diverse experience and knowledge.
- Take home experience and knowledge to yokoten change.

Questions ???

Facility Engineering OP for Treasure Hunts

VP	GM/ AGM	MGR	Coord.	Orig.

		Preparation		Treasure Hunt			Follow up	
		- 4 mo	-3 to –1 months	Treasure Hunting: Day 1	Treasure Hunting: Day 2	Management Presentation	+ 4 wks	+ 3 to +6 months
TMMNA Facility Engineering	Schedule	**Develop long range schedule** Develop Std Agenda	**Set Date** **Notify NAMCs and NA PE Shops of Date** **Schedule Travel and lodging** **Agenda** Modify Agenda to NAMC needs Send Agenda to participating NAMCs	**Kick off** Schedule review TH History and Purpose	**Kick off** Review Day 1 results Review Day 2 schedule		**Schedule report review with NA and NAMC management**	**Schedule database and on site review** **Review database for implementation status of THYYYY items**
	Tools and Actions	**Procedure** **Detail Sheet w/Calculator**	**Request host NAMC provide:** **Equipment schedules** **Prints** **Request support NAMC** **Provide list of attendees** **Review latest Kaizen Database progress reports with host NAMC.** **Review latest Quarterly and Non-Production reports with NAMC.**	**Introductions:** **Handouts:** Data collection sheets Equipment schedules Prints **Explain Detail Sheet** Calculator features Need for accuracy **Lead TH Teams (Assign leaders)** Keep on goal ID energy reduction opportunities Create Detail Sheets	**Lead TH Teams** Keep on goal ID energy reduction opportunities Create Detail Sheets **Work with all teams:** Maintain focus on energy **Assist in creating detail sheets.** **Explain concepts and energy determination to team members.**	**Consolidate Summary Sheets** List all kaizens ID top 3 in each shop **Lead management presentation:** Total savings Production Non-Production Energy MMBTU Dollars $$$ MMBTU $$$ **Awards/Certificate presentation:** MMBTU/Unit T/H Attendee Certificate Best Group/Kaizen Certificate	**Create Report** Potential savings ID Focus items EAP percentage **Review with:** NAMC Mgtt NA Mgt **Database Input** ID as THYYYY	**Perform on site review of focus items.** **Pass implementation information to support NAMCs** **Add suggested improvements to:** Procedure Detail Sheets Data collection
Host NAMC	Schedule	**Schedule confirmation**	**Set Date** **Schedule Shop EMOs for participation** **Schedule dining out locations** **Schedule MCC Presentation on Treasure Hunt**				**Plan Implementation** Emphasis on Focus and operational items	
	Actions		**Make Presentation to MCC on Treasure Hunt** **Collect equip-ment schedules and prints.** **Provide Utility Cost Breakdown:** Electricity Gas Water Etc. **Create presentation:** W/E and B/S energy reports.. List of kaizens being worked on. Energy action plan and progress.	**Provide direction and in depth process knowledge** **ID energy saving Opportunities** **Create Detail Sheets** **Explain specifics of host NAMC operations and equipment.** **Liaise with host NAMC personnel to obtain required data**	**ID energy saving Opportunities** **Create Detail Sheets** **Liaise with host NAMC personnel to obtain required data**	**Support Summary Development** List all kaizens ID top 3 in each shop **Present:** W/E and B/S energy reports.. List of kaizens being worked on. Energy action plan and progress. **Participate in presentation:** Explain kaizens to management	**Suggest improvements for:** Procedure Detail Sheets Data collection **Develop action plan for new kaizens:** Implementation dates Progress	**Update database.** **Schedule TMMNA FAC participation at EMO meetings**
TMMNA Shop PE Groups	Schedule		**Assign PE Engineer for each shop being Treasure Hunted to attend** **Provide list of attendees to TMMNA FAC** **Schedule Travel and lodging**				**Plan Yokoten of TH ideas to design.** Reduce implementation cost Maximize energy reduction in process	
	Actions			**Provide design expertise** ID energy reduction opportunities **Create Detail Sheets**	**Provide background data on host NAMC equipment design.** ID specific features unique to the host NAMC. **Create Detail Sheets**	**Support Summary Development** List all kaizens ID top 3 in each shop **Participate in presentation:** Explain kaizens to management	**Suggest improvements for:** Procedure Detail Sheets Data collection	**Liaise with appropriate TMC PE shop to yokoten concepts into design**
Supporting NAMCs	Schedule	**Schedule confirmation**	**Assign personnel from each shop being Treasure Hunted to attend** **Provide list of attendees to TMMNA** **Schedule travel and lodging**					**Plan implementation of operational and low cost kaizens observed and ID'ed at the TH**
	Actions			**Provide different perspective on the process** ID energy saving opportunities Create Detail Sheets	**Provide information on same process operations and equipment for support NAMC** ID specific features or operations that could be yokoten'ed to the host NAMC.	**Support Summary Development** List all kaizens ID top 3 in each shop **Participate in presentation:** Explain kaizen to management	**Carry back operational improvements to home NAMC.** **Carry back new kaizen ideas.** **Suggest improvements:** Procedure Detail Sheets Data collection	**Push for implementation of yokoten ideas.**

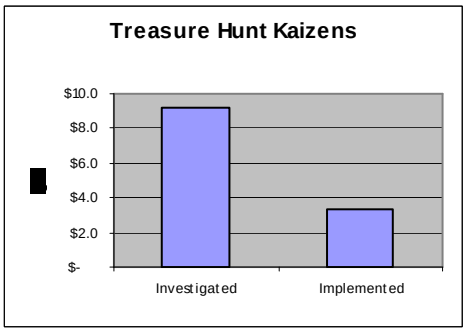
Original, August 11, 2003

Toyota Treasure Hunting

Purpose/History

TMMNA PEFAC designed Treasure Hunts to analyze, reduce and control TMMNA's energy appetite.

Treasure Hunts started in 1999 at TMMK. Since then all NAMCs have been visited at least once. To date identified savings exceed $9.2 million with an implementation rate of approximately 25% for an annual savings in excess of $2.4 million.



Treasure Hunts are TMMNA PEFAC led activities that:

- Focus on identifying the unnecessary use of energy (MUDA) in the North American Manufacturing Companies.
- Utilize the diverse experience and knowledge of team members from all North American Manufacturing Companies.
- Bring together team members from TMMNA PEFAC, TMMNA PE, and similar manufacturing companies at the host location.
- Split attendees into teams and assign each team specific areas of the manufacturing plant to "Treasure Hunt."

PEFAC, in conjunction with the NAMC Facility Managers, has developed a long-term schedule for planning purposes (See Page 4). The NAMC and the specific production areas of the NAMC that will be "Treasure Hunted" are indicated on the schedule so that managers from the NAMC and TMMNA PE can plan for team member attendance. The schedule is for planning purposes and changes in the

shops to be Treasure Hunt'ed can be negotiated between TMMNA PEFAC and the NAMC.

During a Treasure Hunt specific energy saving opportunities are identified. A Kaizen Detail Sheet is created for all identified energy saving ideas. The Kaizen Detail sheet provides the host NAMC with background data explaining what the energy reduction idea is and how to implement it. It documents the existing condition and calculates current energy consumption, provides a suggestion on how to change the process and calculates the projected energy consumption levels after kaizen implementation.

Functional Divisions

NAMCs fall into two categories: Assembly Plants and Unit Plants.

- Assembly plants produce vehicles, they are the largest of the NAMCs, and consume most of TMMNA's energy. Assembly Plants include Facility, Stamping, Body Weld, Paint, Plastics and Assembly shops.
- Unit plants as a whole are more diverse. They provide parts, such as engines, wheels, truck beds, etc., for the manufacture of vehicles. Individual unit plants frequently have one or two shops plus Facilities. Examples of unit shops are Casting, Machining (both engine and AT), etc.

When an Assembly Plant is scheduled for Treasure Hunting TMMNA PE and the other NAMC Assembly Plants are requested to send one team member from each shop scheduled for Treasure Hunting to participate. When a Unit Plant is scheduled for Treasure Hunting TMMNA PE and the other NAMC Unit plants with similar shops are asked to send a team member from each shop scheduled for Treasure Hunting to participate. Assembly plants and Unit plants that do not have similar shops are not expected to participate in Unit plant Treasure Hunts.

Roles and Responsibilities

TMMNA PEFAC: Schedules, organizes and leads the Treasure Hunt. Provide each participating team members with basic forms and training.

TMMNA PEFAC Participants: One PEFAC Team Member is assigned to each Treasure Hunting Team to assist production shop team members in identifying kaizens, determining the present energy consumption and calculating the savings.

TMMNA PE Participants: TMMNA PE will assign one team member from VPE for each shop being Treasure Hunted. PE participants are the subject matter experts on the design of process equipment and provide the engineering knowledge to determine feasibility and cost savings of team member kaizen concepts.

Host NAMC Participants: The host NAMC will assign at least one team member from each shop that is to be Treasure Hunted to participate. While it is expected that the Shop EMO will participate, additional shop support is also desirable. Host NAMC Team Members are the subject matter experts of the NAMC's processes and the operation of the process equipment. Team members will be assigned to Treasure Hunt Teams providing the team with system specific knowledge necessary to evaluate kaizens.

The host NAMC is expected to provide a meeting room for the Treasure Hunt participants to use for the duration of the Treasure Hunt. This room must have internet access and provisions shall be made to map the participants computers to a local printer.

Supporting NAMC Participants: Supporting NAMCs will provide one team member for each shop being Treasure Hunted. Supporting NAMC Team Members are experts in the operation of similar processes and equipment at their NAMC. They are a source of information on equipment and operational kaizen implementation. They bring their experience of equipment operation and kaizen to the host NAMC. What they learn on the Treasure Hunt they take "home" to implement at their own plant, becoming the subject matter experts on operational techniques and equipment modifications observed during the Treasure Hunt.

Schedule:

The schedule below provides NAMCs with planning information for budgetary purposes. The exact date of the Treasure Hunt will be set as far in advance,

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
FY 04	**TMMI**	**TMMWV**	**TMMC**	**TMMAL**
Shops	**Plastics Paint Facility** Completed June 15-17, 2003	**Machining Facility** Completed Aug 24-26, 2003	**Paint - N Assembly - N Facility** Completed Jan 2004	**Machining Facility** Completed Feb 2004
FY 05	**TMMK**	**CAPTIN**	**NUMMI**	**Bodine**
Shops	**Assembly Stamping Facility - 50** Completed Jun 2004	**Machining Casting Facility** Completed May 2004	**Stamping Weld Facility** Scheduled for Nov 2004	**Casting Facility** Completed for Jan 2005
FY 06	**TMMBC**	**TABC**	**TMMI**	**TMMK Powertrain**
Shops	**Weld Paint Facility**	**Stamping Facility**	**Paint Plastics Facility**	**Machining Facility - 801**

Designated implementation year. NAMCs to conduct internal Treasure Hunts.

normally 8 – 10 weeks, as possible to allow support NAMCs adequate time to schedule team member participation.

The goal is to have two of the Assembly Plants and two of the Unit Plants Treasure Hunted each Fiscal year. The schedule indicates specific shops that will be Treasure Hunted at each NAMC; however, as stated previously which shops are to be Treasure Hunted is negotiable based on the needs of the NAMC.

Benefits:

Benefits accrue to all participants.

Host NAMC:

- Benefits from the in depth process knowledge of team members from supporting NAMCs. New eyes view process equipment and its operation.

- Specific energy reduction activities are listed, basic implementation plans provided and savings potential calculated.
- As the host NAMC implements the kaizens, energy consumption is reduced and utility bills go down.

Supporting NAMCs:

- Supporting NAMC team members observe the same processes being performed differently or accomplished in a totally new manner than at their NAMC. Energy reduction is the goal, and the team member will learn new operational techniques for energy reduction that can be applied at their home NAMC.
- The team member also returns with new ideas for process equipment improvement and operation in other areas.
- Team members make valuable contacts with peers at other Toyota plants who become a rich source of help and ideas in the future.

TMMNA PE:

- VPE engineers provide the Treasure Hunt team with design knowledge of the host NAMC process equipment.
- Team member ideas that are not technically possible on the host NAMC equipment provide the VPE engineer with design ideas to incorporate into the next generation of process equipment.
- VPE engineers gain knowledge of the operating conditions of the installed equipment that may suggest design modification for future installation.
- Even kaizens that can be implemented now may be incorporated by NA-PE for new equipment design so kaizens are ‘built in’ from the start.

TMMNA PEFAC:

- Advances TMMNA and the individual NAMC toward its energy reduction goals.
- Develop new ideas for inclusion in the TMMNA Energy Kaizen Data Base and gain in depth knowledge of the operation and equipment capabilities of the host NAMC.
- Assist Toyota in achieving Earth Charter goals and objectives as laid out by Mr. Cho in April 2000.

Pre-Treasure Hunt Preparation:

TMMNA:

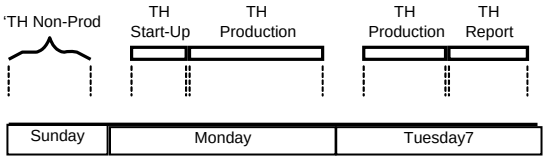
- Prepare a list of the NAMCs Kaizen achievements. Review this list for accuracy and verify the actual energy reduction with the host NAMC's management.
- Review the last Treasure Hunt completed at the NAMC with NAMC EMO and management.
- Identify hotel accommodations for participants who are traveling.
- Request the host NAMC to collect information and materials that the Treasure Hunt team will need. This should include but is not limited to:
  - HVAC: Schedules: Motor sizes, CFM, occupied and un-occupied set points, etc.
  - Lighting: Schedules.
  - Compressors: Units, Capacity(ies), Operating plans.
  - Chillers: Units, Capacity(ies), Operating plans.
  - Boiler: Units, Capacity(ies), Operating plans.
  - Paint Booth Layouts including motor size, kW motor, fan size, current CFM/fan.

- Paint Booth Operating schedules: Start/stop times.
- Small Booth Operating schedules: Start/stop times.
- Major process operating schedule in each shop.

Host NAMC:

- Provide requested information and materials at least two week prior to the Treasure Hunt.
  - HVAC: Schedules, motor sizes, CFM, etc.
  - Lighting: Schedules.
  - Compressors: Units, Capacity(ies), Operating plans.
  - Chillers: Units, Capacity(ies), Operating plans.
  - Boiler: Units, Capacity(ies), Operating plans.
  - Paint Booth Layouts including motor size, kW motor, fan size, current CFM/fan.
  - Paint Booth Operating schedules: Start/stop times.
  - Small Booth Operating schedules: Start/stop times.
  - Major process operating schedule in each shop.
- Assist in identifying hotel accommodations.
- Schedule restaurants for evening dining.
- Plan for on site support:
  - Rooms
  - Network access
  - PPE - other than safety shoes.
  - Safety training.
  -

Methodology/Procedure:



A Treasure Hunt lasts three days and allows the participants to view the NAMC processes and equipment during weekend non-production time, start up, production time, lunch and breaks. The time frame covered therefore lets the Treasure Hunt Teams see the NAMC during all stages of equipment readiness. This provides maximum opportunity for kaizen.

Sunday 12:00 PM – 5:00 PM:

The team gathers at the host NAMC for a safety talk, kickoff meeting and initial Treasure Hunting activities. During the Kickoff Meeting team members are introduced and the Treasure Hunting schedule is presented. Team members are given energy calculators and instructed in how to complete detail sheets.

Team members are divided into Treasure Hunting teams by shop, i.e. Paint team members concentrate on Paint, Plastics on Plastics, etc. A TMMNA PEFAC team member is assigned to each team.

Team members disperse through out their assigned areas to identify instances of weekend energy use that constitute waste. Data is collected so that detail sheets can be generated to document energy and cost savings.

At a predetermined time team members meet for a daily summary meeting.

Monday 5:30 AM – 5:00 PM:

Morning: Treasure Hunting teams are on site before start up to observe shop and plant start up activities. Morning production time is spent observing processes and identifying those in which energy is being used less efficiently than necessary. Production team

members may be asked questions concerning process operation to clarify team understanding. Data is collected (fan size, air flow, CA use, etc.) for detail sheet generation.

Lunch: The Treasure Hunt teams observe lunchtime activity. Process shut down procedures are observed and those processes that use energy during lunch (non-production) time are noted. Data is collected for detail sheet generation.

Afternoon: Teams begin Detail Sheet generation. Return trips to specific processes are required to ensure accurate process understanding and to verify that energy calculations are valid. As much information as is possible is included in the Detail Sheet. In depth information enhances the host NAMC's ability to implement the Kaizen.

A daily summary meeting terminates the day's work.

Tuesday 6:30 AM – 3:00 PM:

Morning: Detail Sheet generation is continued. Discussion between teams about suggested items frequently provides each team with new items to investigate and write up. Additional trips to the plant floor to verify information are made as new items and suggestions from other teams come into play.

Afternoon:

Management Presentation: Host NAMC top management is invited. Treasure Hunt team members from TMMNA and support NAMCs make presentations to the host NAMC's senior management and management representatives from those shops that were Treasure Hunted. Focus is on the top two or three reduction activities for each shop but management is provided a detail sheet for each listed suggestion.

The TMMNA PEFAC representative will present a summary of the Treasure Hunts activities that totalizes potential energy and cost reductions.

Follow Up Activities:

Treasure Hunt Report

TMMNA PEFAC will produce an A3 type report within four weeks of the completion of the Treasure Hunt. The report will list focus kaizen ideas and total energy and cost reductions identified.

Kaizen Data Base

TMMNA PEFAC will update the TMMNA Energy Kaizen Database. All existing kaizen ideas will be identified with the appropriate Kaizen ID number. New ideas will be added to the database and a new Kaizen ID number will be generated.

All items identified by the Treasure Hunt will be tagged in the database. This will allow the database to be sorted so that the implementation of Treasure Hunt items and the resulting savings can be tracked.

http :// T00VM105T.tmmna.tmm.toyota.com/FEKaizens

Treasure Hunt Follow Up

TMMNA PEFAC will conduct two types of Treasure Hunt follow-ups. The Kaizen Database now tracks the status of all items identified as Treasure Hunt identified opportunities. Completion status, potential and actual energy and dollar savings are automatically pulled from the database.

In addition a follow up visit to the host NAMC will be made 3 – 6 months after the Treasure Hunt. The follow up visit will verify implementation status of the major energy saving kaizens identified by the Treasure Hunt.